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Challenges in the Implementation of Hospital Management Information System (HMIS) in Healthcare Sector: A Case Study of Lahore, Pakistan

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Abstract

The implementation of HMIS (Hospital Management Information System) in the healthcare sector of Lahore, Pakistan has the potential to revolutionize the healthcare service delivery by improving efficiency, accuracy, and patient care. Nevertheless, the implementation process is marred with certain challenges. This study examines these challenges, including ICT infrastructure barriers and financial barriers. A quantitative methodology was used to collect comprehensive data regarding the challenges faced during HMIS implementation in three (03) hospitals — that is, Jinnah Hospital, Social Security Hospital at Multan Road, and Social Security Hospital at Shahdara. A survey was conducted using a structured questionnaire to gather the experiences of the healthcare professionals involved in the implementation process. Data were analyzed using multiple linear regression analysis. The results showed the *p*-values of financial barriers and ICT infrastructure barriers as less than 0.05, indicating that they constitute major challenges in HMIS implementation, explaining a significant percentage of the variance. The study confirmed the hypothesis that ICT infrastructure barriers and financial barriers significantly influence HMIS implementation. Considering the rapidly evolving technological landscape, a longitudinal study is required to evaluate the changing impact of financial barriers and ICT infrastructure on HMIS implementation over time.

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***Keywords*:** financial barriers, healthcare policy, Hospital Management Information System (HMIS), ICT infrastructure, implementation challenges

Introduction

The implementation of Hospital Management Information Systems (HMIS) in the healthcare sector has gained attention worldwide as a means to enhance healthcare services to improve patient outcomes. Several studies have examined the benefits and challenges of implementing HMIS.

Khan et al. (2021) conducted research in the province of Punjab, emphasizing the implementation of e-governance initiatives in the healthcare sector. Researchers found several challenges during the HMIS implementation, including the ICT-infrastructure barriers, and financial barriers which influenced the implementation of e-governance. Umezuruike et al. (2017) looked into the challenges of implementing HMIS in healthcare facilities. Their research showed that significant barriers are triggered by technological limitations, including those related to infrastructure, system interoperability, and data security. Kagoya and Kibuule (2018) conducted a case study on the difficulties encountered when implementing HMIS in a hospital in Uganda. The study highlighted software compatibility, insufficient connectivity, and infrastructure concerns as challenges to technological innovation. The study conducted by Kazi et al. (2020) identified the technical challenges, including network connectivity issues, insufficient funding, infrastructure limitations, and system incompatibilities.

Financial barriers could cause significant challenges for healthcare professionals (Razu et al., 2021). In addition, financial barriers prevent the implementation of advanced healthcare technologies, hindering the delivery of accurate, effective healthcare services (Singh et al., 2020). Financial constraints stand in the way of establishing universal healthcare coverage and resolving healthcare disparities at the policy level. The ability of policymakers to guarantee accessible and cheap healthcare for everyone is constrained by a limited public healthcare budget, insufficient health insurance coverage, and the lack of efficient finance methods (Saleem, 2023). These financial limitations hinder the creation and implementation of comprehensive healthcare plans and programs.

The successful implementation and utilization of digital technologies in the healthcare sector is greatly influenced by the information and communication technology (ICT) infrastructure. This background study examines the ICT infrastructure environment in Pakistan's healthcare industry, including its current state, challenges, and possible implications for healthcare delivery. The Pakistani government has launched several initiatives to encourage the development and enhancement of ICT infrastructure in healthcare facilities. There have been initiatives to increase data centers, internet connectivity, and the deployment of hardware and software systems to support digital healthcare solutions (Marques et al., 2019). Access to high-speed internet service remains a serious challenge in rural and remote areas. The efficient adoption of ICT solutions in healthcare facilities needs to be improved by adequate infrastructure and low availability of broadband (Zeadally & Bello, 2021). Frequent power failures and unstable electrical supplies hinder the operation of ICT infrastructure. The availability and accessibility of digital healthcare systems depend on an uninterrupted power supply (Parise et al., 2020).

The limited financial resources given to ICT infrastructure development hinder the deployment of essential hardware, software, and networking equipment. The sustainability and scalability of ICT solutions in healthcare facilities requires additional financial resources (Pandey & Litoriya, 2020). ICT infrastructure development must take patient privacy and health data security into account. A strong ICT infrastructure allows different digital healthcare technologies, like electronic health records, telehealth platforms, and health information exchanges, to be integrated seamlessly, fostering interoperability and collaboration among healthcare providers (Aceto et al., 2018).

The development of Pakistan's healthcare sector depends on creating a strong ICT infrastructure. For the successful implementation of digital healthcare reforms, it is essential to address the issues with connectivity, power supply, resource allocation, and security. Pakistan can significantly improve its healthcare accessibility, effectiveness, and patient outcomes by investing in ICT infrastructure.

Problem Statement

The implementation of HMIS in the healthcare sector of Lahore, Punjab, Pakistan faces challenges related to financial barrier, and ICT infrastructure barriers.

Multiple challenges are faced while implementing Hospital Management Information Systems (HMIS) in the healthcare sector in Lahore, Pakistan. These challenges encompass financial barriers and ICT-Infrastructure barriers. This study aims to identify and analyze these obstacles to facilitate the successful implementation of HMIS in the healthcare sector in Lahore, Pakistan.

Numerous studies have examined the challenges faced during implementation of HMIS in the healthcare sector. Chuah et al. (2018) study examined the financial barriers a public healthcare system encounters while implementing health information systems. The researchers investigate the limitations and financial constraints that may prevent HMIS from being implemented successfully. Based on the study's findings, it is evident that addressing financial problems is critical for maintaining the long-term sustainability and successful implementation of HMIS programs. Cheruiyot (2019) carried out a case study to evaluate the ICT infrastructure's preparedness for implementing HMIS at a regional hospital. The researchers assessed the state of the technology industry today and identified challenges that might hinder the successful implementation of HMIS.

Research Questions

This study aimed to address the following questions:

RQ1: What is the relationship between the implementation of HMIS and financial barriers in the healthcare sector of Lahore, Pakistan?

RQ2: How does the implementation of HMIS correlate with ICT-Infrastructure in the healthcare sector of Lahore, Pakistan?

Research Objectives

The research- objectives of this study are as follows:

To examine the relationship between the implementation of HMIS and financial barriers in the healthcare sector of Lahore, Pakistan.

To examine the relationship between the implementation of HMIS and ICT-Infrastructure in the healthcare sector of Lahore, Pakistan.

Research Hypothesis

Based on research objectives and research questions, the following hypothesis were formulated:

H1: Financial barriers influence the successful implementation of HMIS

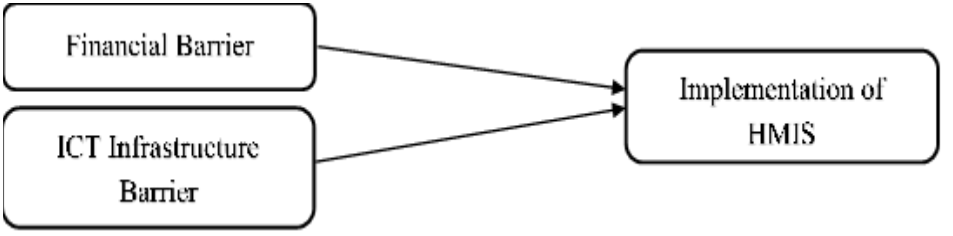
H2*:* ICT-Infrastructure influences the successful implementation of HMIS

Research Framework

The theoretical framework is the base of any research plan, the principal point of the study. The theoretical framework is the interrelated set of concepts that give the study a course. The research framework demonstrates the dependent and independent variables. Financial and ICT-Infrastructure barriers are independent variables, and challenges in implementing HMIS are dependent variables of this research study.

Figure 1

Hypothetical Model



Significance of Study

The significance of this study lies in its exploration of the relationships between the implementation of HMIS and the identified barriers, namely financial barriers, and ICT-infrastructure. The study aims to address the following key aspects:

The study intends to shed light on the challenges faced while using HMIS by examining the financial limitations. It attempts to suggest potential solutions or techniques to get around budgetary constraints and guarantee the successful adoption of HMIS by examining the effects of these barriers.

For the implementation and functionality of HMIS, the study emphasizes the importance of a robust ICT-Infrastructure. The research seeks to offer insights into the necessary infrastructure changes required for effective HMIS implementation by assessing the readiness and limitations of ICT-Infrastructure.

The importance of the study rests in its comprehensive review to identify how these barriers affect the implementation of HMIS. The research's conclusions will help formulate strategies, interventions, and suggestions for overcoming these challenges, facilitating the implementation of HMIS successfully, and enhancing healthcare services in the healthcare sector of Lahore, Punjab, Pakistan.

Literature Review

Today more than ever, the healthcare sector has to implement HMIS to increase productivity in operations, patient care, and decision-making. This review of the literature aims to examine the existing body of knowledge on HMIS implementation in the health sector, providing insights into the crucial elements influencing successful HMIS implementation, challenges encountered during the process, discussing the impact HMIS implementation, and offering recommendations for further research. By synthesizing current knowledge, researchers can identify gaps in the literature and propose recommendations for future studies and practical applications. The study's main objective is to improve understanding and instruct decision-makers and healthcare professionals on the vital components and implementation techniques for HMIS.

Hospital management information systems (HMIS) has become essential for efficiently running healthcare organizations using technology and information management strategies. The collection, organization, retrieval, and analysis of numerous data types, such as patient records, administrative data, financial data, and clinical results, all are made accessible by HMIS. The implementation of HMIS in the healthcare sector is explored in this literature review, focusing on how it influences patient outcomes, organizational performance, and healthcare delivery.

The implementation of HMIS brings both benefits and challenges to healthcare organizations. Benefits include improvements in decision-making, better patient care, simpler workflows, and increased operational effectiveness. However, to optimize these benefits, problems like

unwillingness to adapt, data security concerns, training requirements, and financial constraints must be solved (Simorangkir et al., 2020). Socioeconomic status is becoming more linked to health outcomes, diseases, and fatalities across countries and cultures. According to Tasleem et al. (2022), people with lower socioeconomic status consistently have worse health than people with higher socioeconomic status.

The costs associated with purchasing, implementing, and maintaining HMIS in the healthcare sector are financial barriers. These barriers may greatly influence how successfully HMIS can be implemented and utilized. The purchase of hardware, software, and infrastructure required to implement HMIS is hindered by lack of financing, budget restrictions, and resource limitations. Healthcare sectors also have a heavy financial burden from ongoing operational costs such as software upgrades, employee training, and maintenance (Chuah et al., 2018). Funding is needed to avoid outdated technology, insufficient infrastructure, or compromised system functioning, which could affect the HMIS's overall performance. Inadequate funding may also result in understaffing, poor training, and a lack of support, affecting user engagement and adoption. Ultimately, these financial barriers can make it more difficult for healthcare organizations to fully utilize HMIS and provide the best possible patient care (Wandera et al., 2019).

Due to a lack of ICT infrastructure, many healthcare facilities face challenges in Punjab, Pakistan. (Rashid et al., 2023). Inadequate internet access, unstable power supplies, and outdated hardware & software hinder implementation of HMIS. These restrictions make it difficult for HMIS to function properly, which causes data processing delays, poorer system performance, & reduced user satisfaction. The absence of a strong ICT infrastructure and technical resources is one of the main barriers to implementing HMIS. It would require a solid network infrastructure, sufficient hardware and software, and professional IT support to achieve this. The seamless operation of HMIS can be hindered by inadequate or obsolete infrastructure, resulting in system failures, slow response times, and limited access to information (Eyeleko & Feng, 2023). Therefore, organizations must invest in modernizing their ICT infrastructure to achieve smooth integration and excellent HMIS performance.

For HMIS to operate efficiently, ICT infrastructure must undergo periodic upgrades and routine maintenance (Saint-Germain, 2005).

However, Punjab, Pakistan's hospitals frequently need more funding and technical expertise for routine maintenance and system updates. System functionality can be compromised by outdated hardware and software, which can reduce data processing power and raise the possibility of security flaws.

Methodology

Holloway et al. (2010) defines methodology as "the philosophy and principles that researchers use to guide their procedures and strategies, as well as the presumptions they make about the nature of the research they conduct." Every research needs a research design because it provides the foundation for conducting the research and obtaining meaningful results. It includes choosing the general strategy, data gathering methodologies, sample strategies, and data analysis approaches. Gliner et al. (2011) argue that the research design acts as a road map for researchers, directing them in their attempts to collect and analyze data.

Quantitative research has several benefits, including establishing statistical correlations between variables, analyzing data using statistical methods, and generalizing findings to a larger population (Mohajan, et al., 2020). The study's conclusions may guide decision-making to increase the effectiveness and efficiency of healthcare services by shedding light on the specific challenges that hospitals have implementing HMIS.

This study employed a survey method in health sector of Lahore, Pakistan, i.e., Jinnah Hospital, Social Security Hospital, Multan Road, & Social Security Hospital, Shahdara, Lahore. The questionnaire was personally administered in three hospitals in Lahore, Pakistan.

Selecting a demonstrative sample from the population is a crucial step in research. For researchers to study the challenges and potential in this field, a few scholars have emphasized the significance of choosing certain healthcare organizations and individuals participating in HMIS implementation. For instance, a study on the implementation of HMIS in a sizable city hospital was carried out by Bogale (2021), focusing on the viewpoints, experiences, and experiences of healthcare administrators, IT staff, and healthcare practitioners. Their findings provided valuable insights into the challenges of implementing HMIS in a real-world healthcare facility.

The target population for this case study on the challenges in implementing HMIS in the health sector in Lahore, Punjab, Pakistan, consisted of healthcare organizations and professionals involved in implementing HMIS. Specifically, the study focused on three hospitals named Jinnah Hospital, Lahore, Social Security Hospital, Multan Road, Lahore & Social Security Hospital, Shahdara in the Lahore region.

The estimated population of three hospitals is 3582 as of July 2023 according to HMIS dashboard of HR department.

Table 1

Total Population of Three Hospitals, Lahore, Pakistan

Sr. #	Hospital Name	Doctors	Nurses	Other Staff	Total Count
1	Jinnah Hospital, Lahore.	350	802	1230	2382
2	Social Security Hospital, Multan Road, Lahore.	207	160	523	890
3	Social Security Hospital, Shahdra, Lahore.	69	52	189	310
	Total				3582

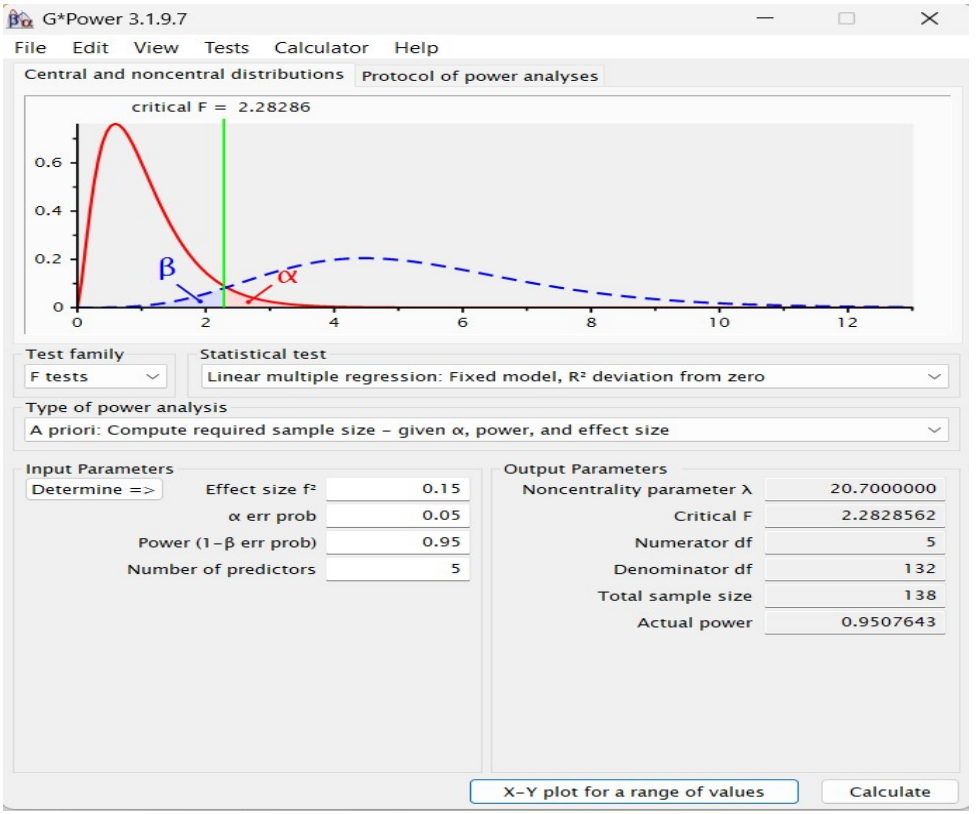
It is crucial to determine the unit of analysis before the initiation of the process of data collection. The unit of analysis may vary based on the nature and context of a given study, encompassing individuals, groups, and organizations (Sakaran & Bougie, 2016). The unit of analysis for this study was the healthcare staff of an organization.

The sampling technique employed for this study was purposive sampling. Purposive sampling allows researchers to select participants based on specific criteria relevant to the research objectives (Campbell et al., 2020). The researchers sought to include individuals from various roles and positions, such as hospital administrators, IT managers, healthcare providers, and system implementers. The anticipated total population determines the sample size. The G power program determines the sample of respondents needed for the study and power analysis. According to Faul et al. (2007), this tool provides power analysis for commonly used tests such

as the *t*-test, *F*-test, *z*-test, chi-square, and exact tests. The sample size of 138 was also deemed fit for getting appropriate results. The figure shows the calculation of the sample size. The sample size of the current study was 138.

Figure 2

Sample Size Calculation



Results

The analysis and findings of the study are outlined in the research project methodology. A sample of 138 respondents was drawn from the total population of three hospitals in Lahore, Punjab, Pakistan. The analysis was done using the 138 filled questionnaires out of 138 questionnaires distributed. The number of questionnaires collected was deemed adequate and sufficient for data analysis, as Francis et al. (2009) suggested.

The statistical analysis in this study was conducted by using the "Statistical Package of social science (SPSS)" to perform the descriptive analysis to find the general understanding of respondents. SPSS is a widely recognized software program that provides researchers with a range of tools for statistical analysis (IBM Corp., 2019). SPSS was used for data summarizing, making presentations in tabular form, and measuring the occurrence frequency of the outcomes. One of SPSS's advantages is its capacity for handling large datasets and performing detailed statistical analyses. Statistical methods such as factor analysis, cluster analysis, regression analysis, and analysis of variance (ANOVA) are available within SPSS. These techniques enable researchers to explore relationships, test hypotheses, and extract patterns and trends from their data. Additionally, SPSS provides various data visualization capabilities, allowing researchers to create excellent charts, graphs, and tables to present their findings. It also offers comprehensive data management capabilities that help researchers organize and clean up their data. It can recode data, deal with missing values, integrate databases, and code new data. It is simpler to construct original datasets for study when using SPSS to filter and choose data groups based on established criteria.

Statistical Package for Social Sciences (SPSS) was used to screen the data after receiving the research responses to ensure it was accurate, relevant, and reliable (Yadav et al., 2014). The findings indicate that the respondents represented a diverse range of employee profiles with respect to gender, age, education level, and designation they have worked in the current organization. All the respondents were the healthcare staff involved in using and implementing of HMIS in their respective hospital areas. Findings from the research data showed that the respondents held a wide range of positions. For this study the outliers were tested using Microsoft excel where the observations were arranged in ascending order. It was evident that all the values fell within the range of 1 -5, with 1 as the lower value and 5 as the higher value for the data set. All the observations were within this range, and there was no abnormal value. Cronbach's Alpha means and standard deviations for elements of challenges in the implementation of HMIS.

The data was obtained from the three government hospitals of Lahore, Pakistan. Even though the study's chosen sample size was substantial enough to account for error problems, additional supplemental data were

gathered using a scientific sampling plan. It is a perfect fit for estimating the population parameters due to the sample's true representativeness Despite the careful sampling process, there is still potential for bias due to missing samples or inadequate measurements.

Stedman et al. (2019) explains that the response rate is calculated by dividing the total number of respondents who filled out the questionnaire and returned it by the predetermined sample size of the study. An excellent response rate of 100% was achieved in this research effort, with the researcher receiving 138 returned questionnaires. All completed questionnaires were also promptly examined after being received.

Effective data screening facilitates the researchers in enhancing understanding of the collected data for the further analysis while identifying any possible key assumption violations regarding the multivariate data analysis techniques application (Mertler et al., 2021)

Acock et al. (2005) proposes that missing values should be replaced with the means in SPSS if there is are a smaller number of missing responses. During the data entry into SPSS, missing values for some items were reported.

According to the respondent profile, 44% of respondents are male, while 56% are female. This gender diversity among the responder group ensures that the research study is well represented. All the respondents were healthcare staff involved in using and implementing of HMIS in their respective hospital areas. Findings from the research data indicate that the respondents held a wide range of positions.

Table 2
Respondent Profile

Demographics	Indicators	Frequency	Percentage
Gender	Male	60	44
	Female	78	56
Age (Year)	0-20	50	36
	21-30	52	38
	31-40	26	19
	41-50	5	4
	51 to above	5	4

Demographics	Indicators	Frequency	Percentage
Education Level	High School	2	1
	Associate's degree	9	7
	Bachelor's	28	20
	Master's	27	20
	MBBS/FCPS	72	52
	Doctor	77	56
Designation	Consultant	18	13
	Allied Professional	16	12
	Administrator	8	6
	Others	19	14
Income	Less than 50 k	18	13
	50 k -100 k	54	39
	100 k-150 k	44	32
	150 k -2 Lakh	10	7
	Above 2 Lakh	12	9
Experience	Less than 1 Year	54	39
	1-3 years	14	10
	3-5 years	29	21
	5-10 years	30	22
	Above10 years	11	8
HMIS Experience	Yes	95	69
	No	43	31

Descriptive analysis is accomplished to define the main features of the data set. Study conducted by Sekaran and Bougie (2010) emphasizes that descriptive analysis is principally described via standard deviation, mean, variance in order to find an overall overview of how the respondents have answered to the questionnaire.

Table 3

Descriptive Statistics of Variables

Variables	*N*	Min.	Max.	Mean	*SD*	*SE*
Implementation of HMIS	138	1	5	3.82	0.95	
Financial Barrier	138	2	5	3.77	0.81	0.07
ICT Infrastructure Barrier	138	2	5	3.88	0.80	0.07

Table 3 shows the descriptive statistics of all variables as a whole. Total number of respondents for the study were 138. Response rate is 100%. ICT infrastructure barrier shows the highest mean value that is (*M*= 3.88, *SD*= 0.80) and financial barrier shows the mean value that is (*M*= 3.77, *SD*= 0.81). Overall, higher means was recorded in the ICT infrastructure barrier as compared to financial barriers.

Table 4

Cronbach Alpha Values of Variables

Sr. No.	Construct wise Alpha	Items of Variables	Alpha if item deleted
1	Implementation of HMIS	9	0.738
2	Financial Barrier	9	0.658
3	ICT Infrastructure Barrier	10	0.610

The Cronbach Alpha values were determined for the 2 independent variables with data from the field study (*N*= 138).

Multiple Linear Regression Analysis

A multiple linear regression using the stepwise method was conducted to determine which independent variables (financial barriers, and ICT infrastructure barriers) in explaining variations in the dependent variable (implementation of HMIS). This analysis aims to identify the challenges that have a statistically significant impact on the implementation of HMIS. The stepwise method automatically selects the most significant challenge while controlling for others, making the analysis more efficient and accurate. The results of this multiple linear regression can provide insights into most critical challenges hindering the successful implementation of HMIS, contributing to better planning and decision-making in healthcare management.

The analysis of factors influencing the implementation of HMIS revealed several significant challenges. These challenges collectively explain a substantial portion of the variance in the implementation of HMIS. The results are summarized in the Model Summary, where the challenges included are the constant, ICT Infrastructure Barrier, and Financial Barrier.

Table 5

Model Summary

R	R^2	Adjusted R^2	*SE*
.532	0.283	0.273	0.813

Note. Predictors: (Constant), ICT Infrastructure Barrier, ICT Technology Barrier, Financial Barrier

R is the multiple correlation coefficient, and its value is 0.532 that reflects the strength and direction of the relationship between the challenges and the implementation of HMIS.

R Square value indicates the proportion of the variance in the implementation of HMIS that is explained by the challenges. In this Model, R^2 is 0.283, meaning that 28.3% of the variance is accounted for by the included challenges. This demonstrates that these factors have a significant influence on HMIS implementation.

Table 6

ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	35.255	2	17.627		
Residual	89.216	135	0.661	26.673	.000
Total	124.471	137			

Note. Dependent Variable: Implementation of HMIS. Predictors: (Constant), ICT Infrastructure Barrier, Financial Barrier

The ANOVA table presented the significance of the challenges in explaining the variance in the implementation of HMIS. The significance value (*p*-value=0.000) is extremely small, indicating that the challenges (ICT Infrastructure Barrier, and Financial Barrier) collectively have a highly significant impact on explaining the variance in the implementation of HMIS.

Table 7

Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	*t*	*p*
	B	*SE*	β		
(Constant)	1.122	0.376		2.982	0.003
ICT Infrastructure Barrier	0.429	0.107	0.361	4.016	0.000
Financial Barrier	0.274	0.105	0.233	2.597	0.010

Note. Dependent Variable: Implementation of HMIS.

The coefficients table show the strength and direction of the relationships between the independent variables and the dependent variable. It indicates how much the dependent variable is expected to change for a one-unit change in each independent variable while holding all other variables constant.

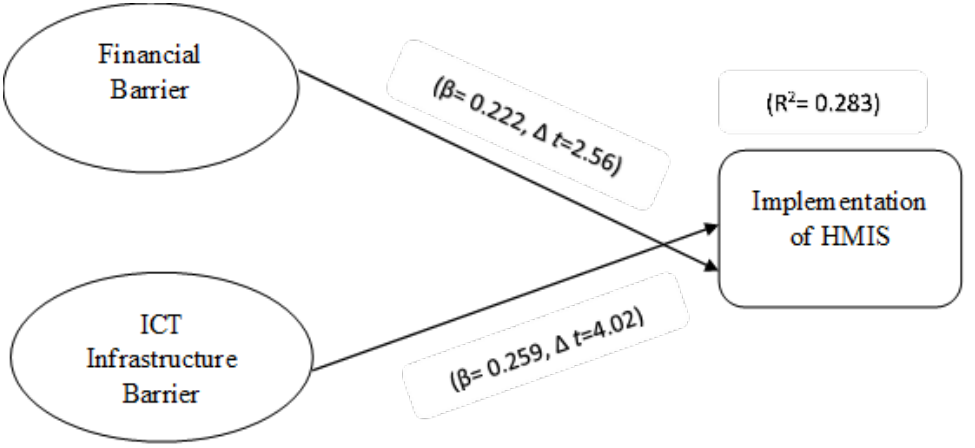
The significance levels (Sig.) associated with each coefficient (e.g., 0.000, 0.010) suggest whether the coefficients are statistically significant. In this case, they are, as they are less than the conventional significance level of 0.05.

H1: There is a significant relationship between Financial Barriers and the implementation of HMIS. The study aimed to explore the relationship between the implementation of HMIS and financial barriers through multiple regression analysis. For the financial barrier, the standard error (SE) of the mean was 0.107, and the t-value=4.016. The *p*-value=0.000 of financial barrier is less than $p<0.05$, indicating an extremely significant difference. The mean score for the financial barrier was significantly different from the test value for equality of means at a 95% confidence level. With $p<0.05$, the null hypothesis is rejected, and the alternative hypothesis is accepted. This indicates a significant relationship between the implementation of HMIS and financial barriers. For financial barriers, the unstandardized coefficients β value is 0.274, indicating that as the financial barrier increases by one unit, implementation of HMIS increases by 0.222 units, assuming all other variables remain constant. This study suggests that addressing financial barriers is essential in the successful implementation of HMIS in the healthcare sector, enhancing efficiency and efficacy.

H2: There is a significant relationship between the ICT infrastructure Barrier and the implementation of HMIS. The objective of this study is to explore the relationship between the implementation of HMIS and ICT-Infrastructure barriers. To investigate this relationship, a multiple regression analysis was conducted. This test aimed to determine whether there was a statistically significant relationship between the implementation of HMIS and ICT-Infrastructure barriers. For the ICT-Infrastructure Barrier, the standard error (SE) of the mean was 0.104 and the *t*-value=2.59. The p-value=0.010 of ICT-Infrastructure Barrier is less than $p<0.05$, indicating an extremely significant difference. The mean score for the ICT Infrastructure barrier was significantly different from the test value for equality of means at a 95% confidence level. Since $p<0.05$, the null hypothesis is rejected, and the alternative hypothesis is accepted. This indicates that there is a significant relationship between ICT Infrastructure barriers and the implementation of HMIS. For ICT-Infrastructure barriers, the unstandardized coefficients β value was 0.429, indicating that as the financial barrier increases by one unit, Implementation of HMIS increases by 0.429 units, assuming all other variables remain constant. The study's findings emphasize the importance of addressing ICT Infrastructure barriers to ensure the effective implementation of HMIS in healthcare sector. Overcoming these barriers is essential for optimizing the use of information and communication technologies in healthcare management.

Figure 3

Predictor Model



The final model of problems and their impact on HMIS implementation provides critical insights into the challenges that influence successful HMIS implementation in a given context. This study used a rigorous method to identify and identified and evaluated challenges, particularly financial barriers and ICT infrastructure barriers. The significance of this analysis lies in understanding how these factors affect HMIS implementation, enabling health organizations to address these challenges successfully. The multiple linear regression analysis results point to significant challenges that play a pivotal role in shaping the HMIS landscape. The final model indicates that ICT infrastructure barriers and financial constraints have substantial and positive impacts on the implementation of HMIS.

A summary of the hypothesis, their method of analysis and results are presented in table 1.8

Table 8

Summary of Hypotheses and Results

Hypothesized Relationship	*p*	*t*	Hypothesis Result
H1: Financial Barriers influences the successful implementation of HMIS	53.72	0.00	H1 supported
H2: ICT-Infrastructure influences the successful implementation of HMIS	56.15	0.00	H2 supported

Conclusion

The findings of the study established that several challenges affect HMIS implementation. As observed in the literature, the challenges underscore the intricate nature of HMIS implementation in the healthcare sector. Notably, financial and ICT infrastructure barriers significantly challenge the practical implementation of HMIS in the healthcare sector.

Financial resources required for HMIS implementation is complex and hinder the procurement of technology, infrastructure, and human resources needed to implement HMIS successfully. Developing strategies for acquiring sufficient funding and streamlining financial resources is essential for ensuring the effective deployment of HMIS.

ICT-related challenges, such as infrastructural limitations, appear as technical constraints. These include challenges such as insufficient

hardware, and insufficient infrastructure support. Overcoming these obstacles will entail significant investments in modernizing technology and infrastructure.

Implementing HMIS in Lahore, Punjab, Pakistan requires a comprehensive approach that addresses the complicated interrelationship of these challenges. Healthcare staff, administrators, and stakeholders must work together to formulate policies that address financial constraints, and update ICT infrastructure. Lahore can realize the revolutionary potential of HMIS by effectively addressing these challenges, which will improve healthcare service delivery, improve patient outcomes, and strengthen the healthcare system for the benefit of all.

Policymakers and health organizations need to understand the consequences of these challenges. It enables them to adjust their efforts to address particular challenges in HMIS implementation. As the health sector increasingly relies on information systems, addressing these challenges is a critical step in ensuring that HMIS is executed appropriately, leading to improved healthcare delivery and patient outcomes. This final model derived from this study serves as a significant tool in maximizing the potential of HMIS to improve healthcare administration and service delivery.

Policy Recommendation

This study proposes several recommendations to improve the success of HMIS implementation in healthcare facilities.

First and foremost, it is critical to strengthen HMIS project planning and coordination. This includes creating defined project timeframe milestones and delineating responsibility among stakeholders. Effective project management can make or break the success of HMIS installation.

Management commitment at all levels is essential. Management should lead in HMIS implementation, providing leadership and dedication to propel the project. The support of management is vital to the successful implementation of HMIS.

The significance of user interaction must be considered by engaging end users in defining system requirements. Their contributions ensure that HMIS is tailored to the particular needs and processes of the healthcare

sector. This user-centric approach has the potential to improve system usability and acceptance significantly.

Healthcare facilities should consider establishing IT departments or units to manage automation programs. These departments can create IT strategy, manage enterprise architecture, and ensure HMIS is seamlessly integrated into current systems.

By adopting these policy guidelines, healthcare organizations in Lahore, Punjab, Pakistan can develop a supportive atmosphere that promotes technological advancement, streamlines healthcare operations, and ultimately improves patient care and healthcare service delivery.

Limitations of the Study

Various limitations to this study should be noted when interpreting its conclusions. Firstly, due to practical restrictions such as limited time and financial resources, the research focused mainly on healthcare facilities in Lahore, which limited the generalizability of the results to the broader context of Punjab, Pakistan. Because other regions may have unique challenges in HMIS implementation, it is critical to exercise caution when applying these findings beyond Lahore.

Another limitation pertains to the study's focus on specific roles including doctors, administrative and other paramedic's staff. It might have ignored the perspectives of other important stakeholders involved in HMIS implementation, such as project implementers and departmental employees such as HR and Finance. Understanding these limitations provide vital background for interpreting the study's findings.

Recommendations for Further Research

This study shed light on the challenges faced while implementing Hospital Management Information Systems (HMIS) in Lahore, Punjab, Pakistan's healthcare sector. At the completion of the current study, several significant findings and recommendations for future research emerge.

Several recommendations for future research have been made in light of these findings. Exploring regional variations in HMIS challenges across Pakistan, involving a broader range of stakeholders in research endeavors, conducting longitudinal studies to assess the long-term impact of HMIS implementation, and conducting comparative research to understand the differences between public and private healthcare sectors are among these.

By adopting these recommendations, future research on HMIS implementation can significantly contribute to the body of knowledge, providing a more profound understanding and effective techniques. Finally, the goal is to improve healthcare information management in Pakistan, improving patient care and healthcare system performance.

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